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Title : PHYSIOLOGICAL AND MORPHOLOGICAL EFFECTS OF ULTRASOUND INTERVENTION DURING PREGNANCY ON NEWBORN RABBITS WITH PARATHYROID HORMONE DYSREGULATION

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Ultrasound bioeffect definition is usually used in the pejorative manner, implying that it is unwarranted, and lead to harmful effects. However in reality, these bioeffects when applied in the correct manner and condition propagates beneficial effects in several medical conditions. Present ex-vivo experimental studies were undertaken to examine the effects of ultrasound intervention during pregnancy over newborn rabbits' hormonal, biochemical, physical, and bone development in maternal hyperparathyroidism (HPT) and hypoparathyroidism (HyPT) with and without ultrasound intervention. There were two different maternal conditions which were HPT and HyPT that compared to normal condition. The HPT consisted of a positive control group devoid of any ultrasound intervention and three experimental groups that received parathyroid ultrasound intervention once at different durations and gestational stages. Similarly, in HyPT also comprise of a negative control group devoid of any ultrasound intervention and three experimental groups that received obstetric ultrasound intervention once at different durations and gestational stages. The intervention were given once during pregnancy in the experimental groups for 30 min, 60 min, and 90 min at the 1st (embryonic day (ED) 6), 2nd (ED 17) and 3rd (ED 28) gestational stage accordingly, using *Philips HD3* 2D B-mode system. Acoustic output parameters were kept constant. Total 136 newborns (control, n=12; HPT, n=62; HyPT, n=62) were euthanized and analysed. In compared to normal condition, maternal HPT caused a significant reduction ($p<0.05$) in positive control group newborn parathyroid hormone (PTH), serum calcium (SCa), body weight (BW) crown-to-rump length (CRL), bi-parietal diameter (BPD), femoral length (FL), femoral diaphysis diameter (FDD), trabecular bone volume fraction (BV/TV), trabecular number (Tb.N), cortical area (Ct.Ar), diaphysis mineral-to-matrix ration (M/M), diaphysis proteoglycan content (PGC), osteochondral junction M/M, osteochondral junction PGC. A significant increase ($p<0.05$) in trabecular separation (Tb.Sp), cortical thickness (Ct.Th), cortical porosity (Ct.Po), bone mineral density (BMD), tissue mineral density (TMD) and hypertrophic zone (HZ) length were noted in positive control group newborn. Compared to positive control groups, parathyroid ultrasound intervention in 2nd gestational stage had significant improved ($p<0.05$) newborn PTH, SCa, BW, BPD, FL, FDD, BV/TV, Tb.N, Tb.Sp, Ct.Ar, Ct.Th, Ct.Po, BMD, TMD, osteochondral junction M/M, PGC and HZ length. In compared to normal condition, maternal HyPT caused a significant reduction ($p<0.05$) in negative control group newborn SCa, BW, CRL, BPD, FL, FDD, BV/TV, Tb.N, Ct.Ar, Ct.Th, TMD, diaphysis M/M, C/M, PGC and osteochondral junction M/M, C/M, PGC. A significant increase ($p<0.05$) in the newborn PTH, Tb.Sp, Ct.Po, and BMD were documented in negative control group newborn. Compared to negative control groups, obstetric ultrasound intervention in 2nd gestational stage had significant improved ($p<0.05$) newborn PTH, SCa, BW, FL, FDD, BV/TV, Tb.Sp, Ct.Ar, Ct.Th, Ct.Po, BMD, TMD, diaphysis M/M, C/M, PGC, and osteochondral junction M/M, C/M, PGC. Outcome of present study postulated the effects of ultrasound intervention during pregnancy over newborn development in maternal parathyroid dysregulation. It is anticipated that this experimental data on newborn rabbit following ultrasound intervention can assist into further insights to the possible favourable effect of ultrasound during pregnancy, a phase which has not been explored fairly to its extremity.